

For 9/14

To: Bill Turner 399-2558
 From: Paul Brody
 5/3/04 4 pages



Engineers
 Scientists
 Consultants

April 29, 2004

Mr. David Brody
 Vice President
 Nabnasset Lake Preservation Association
 56 Lakeshore North
 Westford, Massachusetts 01886



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Re: **Post-drawdown Mussel Survey at Nabnasset Lake**
ESS Project No. N409-000

- 1233

Dear Mr. Brody:

At the request of the Nabnasset Lake Preservation Association (NLPA), ESS Group, Inc. (ESS) completed a survey of the mussel community of Nabnasset Lake on March 25, 2004. In addition, ESS also made observations on the effect of the drawdown on the targeted plant, Eurasian milfoil. As you may know, the first three months of 2004 were particularly dry. Typically 12 to 14 inches of precipitation fall over the January through March period; however, at the time of our mussel survey, the region had experienced a precipitation deficit of more than 8 inches. As a consequence of this, the water level of the lake at the time of our survey had only been raised slightly above the lowest drawdown level. This enabled us to clearly assess areas of the lake bottom that had been exposed to the effects of the winter drawdown and compare these areas to areas that had remained submerged.

ESS' survey focused on the lake's northern shoreline between the property at 56 Lakeshore North and Shipley Swamp including portions of the swamp in the vicinity of its outlet to the lake. Although a continuous visual inspection was conducted over this entire stretch of shoreline, a total of 16 mussel survey plots were specifically evaluated. The 16 survey plots were selected to be paired plots with 8 of the plots located in water depths that had been exposed during the drawdown and 8 of the plots located in water depths that had remained inundated. The paired plots were spaced approximately 200 to 400 feet apart over the entire shoreline length surveyed. At each plot location the sediment from a 1 square foot area was sampled by using a clam rake that had been retrofitted with a 1/4-inch mesh screen. This enabled us to collect both live mussels and dead mussel shells while quickly washing away much of the sediment and debris. Table 1 summarizes the findings of the mussel survey.

The mussel species observed during the survey, along with their relative abundance in Nabnasset Lake, included the following species:

- *Elliptio complanata* - Abundant
- *Lampsilis radiata* - Occasional
- *Pyganodon cataracta* - Rare
- *Sphaerium* sp. - Rare
- *Anodonta imbecilis* - Abundant

These species are all commonly found in waters of central and eastern Massachusetts and none of these are listed as rare, threatened, or endangered in the state. The mussel of greatest concern is *Lampsilis radiata*, as it is declining throughout the region and should be closely monitored to ensure that the population is maintained in Nabnasset Lake and to evaluate its rate of recovery.





Mr. David Brody
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Table 1. Number of live mussels and dead mussels (including shells) by paired survey plot, Nabnasset Lake and Shipley Swamp, March 25, 2004. Samples were generally spaced equidistant between 56 Lakeshore North and the outlet of Shipley Swamp.

Location	Area Exposed to Drawdown		Area Not Exposed to Drawdown	
	Alive	Dead	Alive	Dead
Site 1 - 56 Lakeshore North	0	9	4	5
Site 2	1	7	6	4
Site 3	0	3	4	4
Site 4	0	1	7	2
Site 5	0	0	1	0
Site 6	1	1	4	2
Site 7	1	6	0	3
Site 8 - Outlet of Shipley Swamp	0	3	2	1
Totals	3	30	28	21
Average Density (no./ft²)	0.38	3.75	3.50	2.63

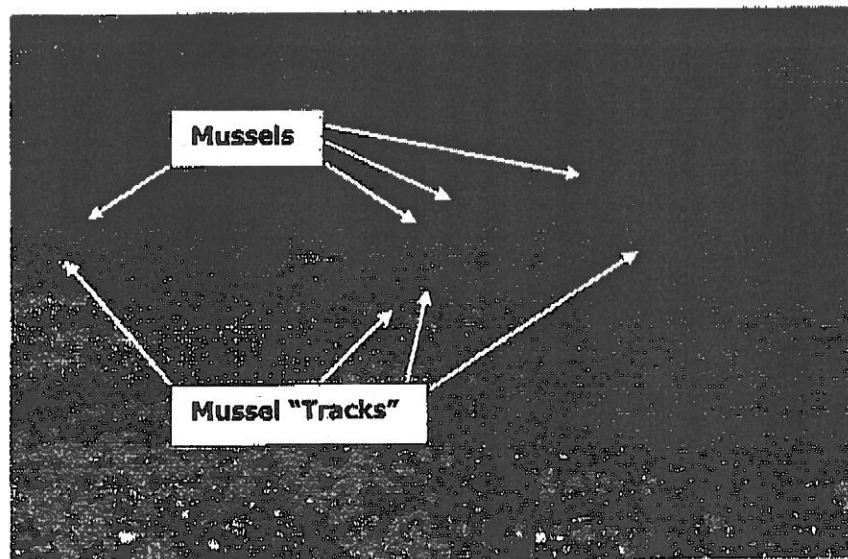
In the area not exposed to drawdown, the mussel population was found to have between 0 and 7 live mussels/ft² with an average density of 3.50 live mussels/ft². The dead mussels, or mussel shells, obtained from this area was similar or slightly lower, with between 0 and 5 dead mussels/ft² and an average density of 2.63 dead mussels/ft². The total mussel count and density of both living and dead mussels in the areas not exposed to drawdown was 49 and 6.13, respectively.

In the plots surveyed that had been exposed to the drawdown, the mussel population was found to have between 0 and 1 live mussels/ft² with an average density of 0.38 live mussels/ft². The dead mussels, or mussel shells obtained from this area was substantially higher, with between 0 and 9 dead mussels/ft² and an average density of 3.75 dead mussels/ft². The total mussel count and density of both living and dead mussels in the areas exposed to drawdown was 33 and 4.13, respectively.

Since total mussel density (living and dead) was greater in the deeper waters that were not exposed to drawdown (6.13 mussels/ft²) compared with the total density documented in shallower waters (4.13 mussels/ft²), it is reasonable to conclude that either the mussel population was lower in the shallower waters to begin with, or, more likely, that many mussels were able to successfully migrate to deeper areas as the water receded. This observation is supported by the fact that the number of dead mussels in the shallower areas was only slightly greater than the number of dead mussels in the deeper waters (3.75 mussels/ft² vs. 2.63 mussels/ft²). In addition, photo documentation of mussel migration was made during the period of drawdown that clearly shows evidence of this migration (Photo 1).



Photo 1. Mussel Migration (courtesy of David Brody) as evidenced by linear "tracks" between the shore and the mussel. Mussels are moving toward deeper water in all instances. Photo taken during period of active drawdown.



It is likely that in areas of the lake where the shoreline slope was gradual, more mussel mortality occurred since the rate of migration would probably not have been sufficient to keep pace with the rate that the water receded. In areas of the lake with more steeply sloped bottom contours, a mussel would need to only travel a short distance with each inch of water level drawdown.

Summary and Conclusions

It would be unreasonable to assume that mussel mortality or other adverse impacts to the flora and fauna of Nabnasset Lake could be entirely avoided during a drawdown or any other form of active management. Consequently, the impact to the mussel population was consistent with what would be expected from a drawdown of this magnitude. It should be emphasized that despite the unavoidable impact, the mussel population in the lake remains healthy.

ESS believes that the current approach to controlling the nuisance aquatic weed growth in Nabnasset Lake, which includes semi-annual drawdown with limited herbicides and harvesting, is an appropriate and sustainable approach for addressing the weed problem. Based on our assessment of the potential impacts to Shipley Swamp that we conducted for the Town of Westford during 2002, and the most recently conducted survey of the lake shoreline and the mussel community, ESS maintains that a controlled winter drawdown does not pose a substantial risk to the flora or fauna of Nabnasset Lake or Shipley Swamp. In fact, we believe that the exotic and highly invasive plant species (purple loosestrife and Eurasian milfoil) currently present and spreading within the swamp pose a substantially greater threat to the biota and ecology of Shipley Swamp if they continue to remain unmanaged.





Mr. David Brody
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If you have any questions regarding this matter, please call me at our Wellesley office at (781) 489-1103.

Sincerely,

ESS GROUP, INC.

A handwritten signature in cursive script, appearing to read "Carl D. Nielsen for".

Carl D. Nielsen
Senior Water Resources Scientist

